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New challenges to authoritarian state stability: the proliferation of modern information communications technology

Bylsma, Colin D.

Monterey, California: Naval Postgraduate School

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THESIS

NEW CHALLENGES TO AUTHORITARIAN STATE STABILITY: THE PROLIFERATION OF MODERN INFORMATION COMMUNICATIONS TECHNOLOGY

by

Colin D. Bylsma
Samuel T. Colby

December 2015

Thesis Advisor: T. Camber Warren
Second Reader: William P. Fox

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Numerous political commentators have proclaimed the rapid proliferation of information and communications technology (ICT) as the harbinger of instability to undemocratic governments. But does the spread of ICT necessarily destabilize authoritarian regimes, and does it impact different types of autocracies to the same degree? To determine the effect of ICT on governments, this study adopts a quantitative approach. The relationship between state stability and ICT penetration in countries from 1990 to 2013 is examined using logistic regression techniques. The results of the analysis indicate a statistically significant negative relationship between the onset of violence and ICT presence. Authoritarian regimes, specifically those with institutionalized succession regimes, such as monarchies and one-party states, appear to experience less violence as ICT levels increase, whereas stability changes only marginally in democratic countries. Governments and individuals may utilize ICT in disparate manners in pursuit of opposing objectives, but the spread of ICT to authoritarian regimes seems to favor existing institutions rather than the populace. To better understand the relationship between the stability of authoritarian regimes and ICT penetration, it is recommended that future research blend qualitative analysis with an examination of more specific elements of ICT.

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NEW CHALLENGES TO AUTHORITARIAN STATE STABILITY: THE PROLIFERATION OF MODERN INFORMATION COMMUNICATIONS TECHNOLOGY

Colin D. Bylsma
Major, Royal Canadian Air Force
B.A., Royal Military College of Canada, 2000

Samuel T. Colby
Major, United States Army
B.S., West Point, 2004

Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN DEFENSE ANALYSIS

from the

NAVAL POSTGRADUATE SCHOOL
December 2015

Approved by: T. Camber Warren, Ph.D.
Thesis Advisor

William P. Fox, Ph.D.
Second Reader

John Arquilla, Ph.D.
Chair, Department of Defense Analysis

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Numerous political commentators have proclaimed the rapid proliferation of information and communications technology (ICT) as the harbinger of instability to undemocratic governments. But does the spread of ICT necessarily destabilize authoritarian regimes, and does it impact different types of autocracies to the same degree? To determine the effect of ICT on governments, this study adopts a quantitative approach. The relationship between state stability and ICT penetration in countries from 1990 to 2013 is examined using logistic regression techniques. The results of the analysis indicate a statistically significant negative relationship between the onset of violence and ICT presence. Authoritarian regimes, specifically those with institutionalized succession regimes, such as monarchies and one-party states, appear to experience less violence as ICT levels increase, whereas stability changes only marginally in democratic countries. Governments and individuals may utilize ICT in disparate manners in pursuit of opposing objectives, but the spread of ICT to authoritarian regimes seems to favor existing institutions rather than the populace. To better understand the relationship between the stability of authoritarian regimes and ICT penetration, it is recommended that future research blend qualitative analysis with an examination of more specific elements of ICT.

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LIST OF ACRONYMS AND ABBREVIATIONS

AIC	Akaike information criterion
AUC	area under the curve (statistic)
CPC	Communist Party of China
CSP	Center for Systemic Peace
DPRK	Democratic People's Republic of Korea
GDP	gross domestic product
ICT	information and communications technology
PRC	People's Republic of China
ROC	receiver operating characteristic
SMS	Short Message Service
UCDP	Uppsala Conflict Data Program
UN	United Nations

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I. INTRODUCTION

The revolution will not be tweeted.
– Malcolm Gladwell, October 4, 2010

The revolution will be tweeted.
– Blake Hounshell, June 20, 2011

At first glance, it appears that author Malcom Gladwell grievously underestimated the destabilizing power of social media, while political commentator Blake Hounshell astutely understood the nature of events unfolding before his eyes in the Middle East. The Arab Spring was quite possibly a watershed moment in the relationship between authoritarian regimes and their citizens. Initiated in December 2010, with the self-immolation of Tunisian Mohammed Bouazizi and subsequent anti-government protests, the Arab Spring engulfed large portions of the Middle East, swiftly toppling two long-standing regimes and destabilizing several other governments. If Bouazizi was the corporeal catalyst for social revolution, then Wael Ghonim was the movement's chief spokesman and manager, harnessing the organizational power of social media, especially Facebook, to develop ideas and mobilize individuals (El-Baradei, 2011). Yet, while the effects of the Arab Spring continue to reverberate across the region, the full promise of social media did not materialize, as toppled regimes did not necessarily give way to democratic institutions, nor did the revolutions seem to materialize significantly beyond the Middle East.

With the rise and spread of information and communications technology (ICT), social media, a prominent subset of this modern, networked paradigm, has generated myriad conjectures and hypotheses regarding its social impact. The term ICT covers many now-ubiquitous items of modern life, such as laptops, mobile phones, pagers, and any device networked to another or directly to the Internet. These technologies have changed the nature of social interaction by fundamentally increasing the speed and organizational capacity of information flow within networks. Indeed, the potential to

harness ICT for social change occurred long before the events of the Arab Spring materialized.

In 1996, John Perry Barlow posted a cyber utopian manifesto: "Declaration of Independence of Cyberspace." Directed at national governments, specifically the United States, he described the Internet as, "naturally independent of the tyrannies you seek to impose on us," further exhorting, "we are creating a world where anyone, anywhere may express his or her beliefs, no matter how singular, without fear of being coerced into silence or conformity" (Barlow, 1996). Another similar early theory posited that ICT would herald the end of authoritarian governments through the empowerment of disadvantaged populations (Ellis, 1999). Nearly two decades later (and nearly half a decade removed from the initial events of the Arab Spring) these visions have yet to reach fruition. Indeed, the Internet and mobile devices have served as powerful tools for gathering data, transmitting messages, and organizing action, but they provide utility to both citizens *and* governments.

As is often the case, the truth regarding correlation and causation proves difficult to untangle. Some authoritarian regimes, such as Tunisia and Egypt, succumbed to the demands imposed by citizens empowered through ICT, but other regimes, like Saudi Arabia, Bahrain, Kuwait, and Jordan, have proven remarkably resilient. The People's Republic of China (PRC) exhibits extremely high levels of ICT penetration; yet, the Communist Party of China (CPC), a one-party state, remains unquestionably in control and has not suffered any significant challenges to its control. A closer examination of other non-democratic states also reveals a disparate variety of governing styles, power concentrations, and methods for controlling information (Wahman, Teorell, & Hadenius, 2013). These variations further complicate the role and importance of ICT in modern state stability. To better determine and understand the relationship between stability within authoritarian regimes and the spread of ICT among populations, it is necessary to conduct a macro-level quantitative analysis of available, relevant data. Through this method we examine the following question: *What effect does increasing access to information from the spread of information and communications technology (ICT) have on state stability in different types of authoritarian regimes?*

II. LITERATURE REVIEW: UNPACKING THE NATURE OF THE QUESTION

It is necessary to unpack this question into smaller areas of research, identifying the most relevant theories. There exist two main schools of thought regarding authoritarian governments, their resistance to destabilizing threats, and the effects of increased access to information afforded by ICT. There is also a developing body of literature that attempts to classify authoritarian regimes into distinct categories. Taken together, the understanding of the various viewpoints present a clearer picture of the effects of the digital revolution on different types of autocracies.

A. ACCESS TO INFORMATION

Cyber utopianism arose as the first major camp to study the effects of ICT on authoritarian regimes, with cyber-realism developing later as a reaction to the former (Morozov, 2012). A significant amount of the literature views the spread of ICT as an unstoppable democratizing force, which can be delayed but never defeated (Lagerkvist, 2010). Adherents of this school of thought hold that the power of ICT to facilitate social connectivity allows for the creation of new political sociologies, with which authoritarian regimes must continually contend (Cunningham, 2013).

Cyber utopianism tends to focus on the population's access to information within authoritarian regimes. The underlying tenant of cyber utopianism asserts that improvements to communication abilities provided by ICT will cause an increase in the number of democratic governments around the world. According to the theory, there are several reasons why non-democratic regimes will be unable to survive in a connected world. First, spreading information critical of a government is greatly simplified through modern ICT as compared to printed media, radio, and even television, all of which have relatively high startup costs, and are relatively easy to centrally control. Second, interpersonal network development is facilitated because the Internet allows interactions between groups that are geographically and socially separated. Third, non-governmental groups can easily and quickly leverage mobile technology to coordinate the activities of

large numbers of people. Finally, the rapid pace of technological advancement will continually outpace regime efforts to censor and control information. All of these factors make cyber utopianism a popular school of thought among certain audiences, especially American political and technological circles (Tkacheva et al., 2013). According to proponents of cyber utopianism, then, the following hypotheses may be offered:

H1: Owing to the destabilizing influences of ICT, authoritarian regimes will attempt to restrict ICT into their jurisdictions; and

H2: Increasing levels of ICT within authoritarian regimes will create correspondingly increasing levels of instability.

Cyber-realism, on the other hand, places greater emphasis on country-specific factors, allowing for a more nuanced view in which authoritarian regimes may leverage ICT to maintain power indefinitely. This school of thought is less well-defined, but it encompasses a broad rejection of the often-unsupported cyber utopian notions for a more nuanced country-by-country approach in which ICT *may* favor the state over the population (Morozov, 2012). Proponents of this theory have developed numerous counter arguments to the tenants of cyber-utopianism while retaining the premise that access to information *may* serve as a threat to regime stability. They argue that there are two main techniques used by authoritarian governments to counter-act possible instability caused by ICT: outright control or limits on technology, and selective censorship.

Outright control or prohibition of ICT is the first major tactic employed by authoritarian governments. The most extreme contemporary example is the Democratic People's Republic of North Korea (DPRK), which physically modifies all television and radio receivers to receive only government broadcasts (Kretchun & Kim, 2012). Very few North Koreans even have access to the Internet and cellular phones were completely banned until 2008. In less totalitarian situations, regimes often maintain control, directly or indirectly, of the physical infrastructure of ICT; thus, they can simply shut-off servers and networks. The governments of Iran and Syria used this technique extensively in 2009 and during the Syrian civil war, respectively (Howard & Hussain, 2013).

The second major approach taken by authoritarian regimes toward ICT is to co-opt content to facilitate repression. The global debate regarding content encryption continues, but it currently favors a state's desire for invasive access over individual privacy (Schneier, 2015). Thus, networking programs and websites remain vulnerable to state security personnel who use software to identify dissidents, sometimes even if the ICT infrastructure is not under direct state control. Authoritarian regimes, such as the CPC, have used and continue to use, selective censoring to control and direct collective action to minimize the danger to state stability (King, Pan, & Roberts, 2013). Many technology companies, wittingly or not, even accept contracts from authoritarian regimes to maintain their corporate filtering and surveillance technology on the cutting edge (Gobel, 2013; Risen, 2015). While there exist many factions within the cyber realist camp that tend towards utopianism in the long term (Lagerkvist, 2010), the short term favors a more balanced, refined outlook whereby ICT are merely tools ready for use by governments *and* citizens (Rød & Weidmann, 2015). Thus, proponents of cyber realism may propose the following alternate hypotheses:

H3: Owing to ease of control over ICT infrastructure, authoritarian regimes will not inhibit the spread of ICT into their domains; and

H4: Increasing levels of ICT within authoritarian regimes will decrease levels of instability, at least in the short-term.

B. AUTHORITARIANISM

While many of the world's approximately 195 countries may fit into any number of broad, artificial categories, they are often ordered on a spectrum of political participation. At one end of the spectrum, either one or a small number of people in the country are involved in political participation (authoritarian). On the other end, most or all of a country's population are permitted to participate in political decisions (democracy). Analysts have attempted to differentiate the subset of authoritarian governments further into even more distinct categories. These categories were devised for various reasons, including the ability to measure factors like state stability, efficiency, and chances of democratic transition (Wahman et al., 2013). Categorization schemes

create certain generalizations with most forced to classify regimes with characteristics belonging to multiple categories or whose characteristics have changed over time into a single type.

Current academic research separates authoritarian regimes into a range of three to six categories based on different criteria (Geddes, 1999; Wahman et al., 2013). Several of these works analyze data compiled by the Center for Systemic Peace (CSP), which provides a numerical ranking (polity score) based on measurements of political participation, checks on executive power, and political competition. Most categorization systems concern themselves with how power is originally acquired (Hadenious, 2013), but some rely solely on the method of political change (Diamond, 2002; Cheibub, 2010, Goldstone et al., 2010). Almost all models include military regimes as one of their major types. Thailand, for example, is considered a military regime, following the events of the 2014 coup (Whitlock, 2015), because national power is held exclusively by the military. Three of the four most prominent models also contain a category for monarchies or royal dictatorships (Geddes et al., 2012; Cheibub et al., 2010; Diamond, 2002), with Oman and Saudi Arabia serving as contemporary examples. One of the simplest models defines regime types other than military dictatorships and monarchies as civilian dictatorships (Cheibub, Gandhi, & Vreeland, 2010), while one of the most complicated models differentiates between military dictatorship, monarchy, no party, one party, limited multi-party, and hybrid (Wahman et al., 2013), for a total of six, with exceptions. A unique and competing system developed by Larry Diamond contains four categories based on the mechanism of power transfer: hegemonic electoral authoritarians, politically closed authoritarianism, competitive authoritarians, and ambiguous regimes (Diamond, 2002).

One of the research fields associated with authoritarian regime categorization considers how different government types respond to opposition. One particular study of all authoritarian regimes since 1946 (Geddes, 1999) determined that when confronted by powerful resistance movements, military regimes tended to cede power, personal dictatorships resisted until they were violently overthrown, and one-party regimes endured the longest. The latter regime type often used co-option of the opposition as a successful tactic to extend the government's reign.

Lastly with regards to government types, Diamond and others have noticed a change in the prevalence of certain types of regimes that fall short of the full democracy classification (Diamond, 2002). His work emphasized that politically closed authoritarianism is becoming rare since the fall of the Soviet Union. While contemporary examples, such as Kazakhstan, the PRC, and the DPRK certainly still exist, the last 20 years have seen an increase in the number of states which fall in the middle of the range between liberal democracy and politically closed authoritarianism. Diamond also points out that military dictatorships have all but disappeared except as a transitional government type, although there are several governments, especially in South East Asia, with large levels of military government involvement (Diamond, 2002). These states often create facades of popular participation; but elections are either rigged or mostly ignored, the rule of law is not respected, and individual freedoms are restricted (Pletsch, Miller, & Karp, 2014).

Few works appear to directly and exclusively address how different types of authoritarian regimes respond to the increasing ubiquity and pervasiveness of ICT. There is, however, an increasing body of work regarding ICT effects on conflict, to include propagation and suppression (Dafoe & Lyall, 2015; Pierskalla & Hollenbach, 2013; Warren, 2014, 2015). Numerous case studies have examined one, two, or three different countries, but not in a systematic, quantitative manner (Whitlock, 2015; Ellis, 1999; Hess, 2013). A large body of material focuses on the PRC (King, Pan, & Roberts, 2013; Kalathil & Boas, 2001; Lagerkvist, 2010; McAfee, 2013; Mengin, 2004) for use in case studies. Very few analysts focus on broad-spectrum qualitative and quantitative research regarding access to information and the types of authoritarian regimes that must contend with the burgeoning ICT phenomenon (Rød & Weidmann, 2015). Determining if and how increasing access to information from the spread of ICT creates different levels of instability in different types of authoritarian regimes is the next important step along this line of inquiry.

The underlying assumption behind this line of research is that faster and more efficient one-to-one and many-to-many communications decreases the ability of some types of authoritarian regimes to control their populations. In fact, governments of all

types across the world appear to consider this notion axiomatic; the existence, budgets, and activities of agencies such as the United States National Security Agency and the Russian Federation Federal Security Service seem to confirm this belief. But why do they assume that this is the case? Some of the interconnected theories underpinning this research point to the ideas that a more connected populace will demand greater political participation, challenge the state's monopoly on violence, or spread unofficial narratives against regime positions (Gobel, 2013; Warren, 2015).

The idea of influence through soft power or narratives using ICT is a growing field of research (Warren, 2015) that acknowledges that the ability for one node on a network to instantly communicate with multiple other nodes was previously reserved solely for radio and television broadcasters. Internet-connected computers or the Short Message Service (SMS) function on modern cellular phones allows rapid dissemination of messages in near real time. Prior to the emergence and maturity of these technologies around 1990, shaping a population's perception of an event or situation required either physical proximity, television or radio dissemination, or time. Additionally, so-called old media remains a useful tool to disseminate official propaganda, but it does not provide the direct feedback to institutional entities that ICT enables. Some types of regimes may prove more adept at confronting the novel challenges posed by ICT than others.

All regimes erect institutions to legitimize and maintain power. Basic forms of governmental institutions include military, security and police forces, wealth redistribution systems, health providers, and sanitation organizations. Countries differ in the degree to which the government controls these institutions; the contrast between democracies and autocracies is as extensive as the differences between their succession mechanisms. Most modern democracies have robust, institutionalized succession mechanisms that entail free, open, and fixed election cycles, including term limits for their leaders. Some types of authoritarian regimes also institutionalize succession mechanisms but many have not. For instance, the CPC, a one-party state, regularly convenes its National People's Congress every five years and transfers power every ten. Monarchies arguably institute the strongest and most clear power transition mechanism: hereditary succession, transferring power upon the leader's death or incapacitation. On

the other hand, most personal dictatorships do not formalize succession mechanisms, often only signaling a successor near the end of a reign due to failing health or insurrection. Military regimes typically do not have resilient institutionalized succession mechanisms, behaving much like personal dictatorships or developing ad hoc governmental instruments to transition to other forms of governance, such as democracy, as recently observed in Pakistan, Egypt, and Myanmar.

Evidence suggests that authoritarian regimes with more robust institutionalized succession mechanisms, such as those commonly associated with one-party states and monarchies, tend to survive longer than those without, such as personal and military dictatorships (Geddes, 1999). The manner in which these four broad types of governments prepare for succession directly influences their ability to manage and resist opposition. Without institutionalized succession mechanisms, opposition forces in personal dictatorships are left with two glaring choices regarding regime change: waiting for the leader to die of natural causes, or overthrowing the leader, usually through violent means. One-party states are much more capable of adapting to opposition forces because they have institutional mechanisms that allow for the possibility of change. This type of government also allows for the cooption of opposition members into the party, something much more easily achievable in one-party states as compared to military regimes and personal dictatorships (Geddes, 1999).

This adaptability and propensity for cooption exhibited by regimes with institutionalized succession mechanisms may prove advantageous as ICT permeates their societies. ICT confers benefits to both opposition forces and governments. The alluring prospects for change that social media platforms have offered to anti-government protestors, such as those that occurred during the Arab Spring, may embolden such forces confronting regime types that do not have formal mechanisms for power transference. To these opposition forces, ICT may provide the organization with the capacity to rally and direct violence toward oppressive regimes that offer no alternative. Citizens in one-party regimes will be afforded this same ability in the presence of ICT, but opposition groups may have a greater propensity to channel their desire for change into existing mechanisms. One-party regimes employ ICT both overtly and surreptitiously to gather

feedback, to direct opposition away from violence and toward the institutionalized platforms of power transition, and to monitor dissidents (King et al., 2013). Taken together, the increased capabilities provided by modern technologies and the greater structural adaptability of authoritarian regimes with institutionalized succession mechanisms (one party states and monarchies), as compared to other authoritarian regime types, leads to a final hypothesis:

H5: Given their existing institutionalized succession mechanisms and their propensity to co-opt opposition forces, one-party regimes and monarchies will experience less internal violence, as compared to military and personal dictatorships, in the face of rising ICT rates.

III. METHODOLOGY AND EMPIRICAL DATA

A. ANALYTICAL TIME PERIOD

In order to examine faithfully whether the increasing access to information from the spread of ICT creates different levels of instability in different types of authoritarian regimes, this study quantitatively examines all countries from 1990 to 2013, but primarily focuses on authoritarian states. Data availability for some technologies is a significant constraint, but faithful record keeping appears to parallel the global rise of ICT beginning in the early 1990s, allowing for a close examination of the initial spread of ICT in both individual states and categories of countries.

B. METHODOLOGICAL STEPS

The decision to examine multiple countries over an extended period provides more broadly applicable conclusions. However, the possibility of achieving results that are both statistically significant and reproducible requires development of a focused, robust, and systematic research methodology, which itself requires the establishment of strict criteria. The study proceeds in a systematic fashion that entails three main steps. The first step involves the analysis of ICT penetration and incidents of violence in *all* states. The second step examines this relationship within authoritarian states only, including the distinct categorization of regimes. The third step includes robustness checks of the analyses completed in steps one and two and an attempt to develop additional observable implications to better understand and explain the nature of the relationships uncovered in steps one and two.

1. Choosing and Defining the Variables

The focus of this quantitative analysis centers on government stability in the face of change brought by the spread of ICT; thus, basic units under investigation are internationally-recognized, sovereign UN member states. Although there are numerous possible variables for a worldwide study, this article focuses on several well-recognized

datasets from previous works. These variables are examined using the scientifically established format of a dependent variable, an independent variable, and several controls.

a. Dependent Variable – Regime Stability

This study's dependent variable is state stability. Stability is a nebulous condition defined and analyzed in myriad different ways by many observers. To reduce ambiguity in this study, stability is treated as a function of violence, while related variables serve as controls. The initiation of civil conflict, as defined by researchers such as Goldstone (Goldstone et al., 2010), is treated in this study as a condition of instability. Small-scale events, such as protests, low numbers of civilian deaths, and general dissatisfaction with the regime, are not considered conditions of instability in either democratic or authoritarian regimes. The University of Uppsala maintains a dataset of conflict that meets these simple conditions. *The Uppsala Conflict Data Program* (UCDP) is a record of violence defined as a contest between a state and a non-state actor resulting in at least 25 battle related deaths (University of Uppsala, 2015). Thus, stability is considered a binary condition in this study: either a regime is stable, or it is not. In this regard, the dependent variable under study, regime stability, is dichotomous. For a given year, states that do not experience an onset of internal violence that results in more than 25 deaths receive a score of 0. States receive a score of 1 if, for any given year, they do experience an onset of violence with greater than 25 associated deaths. The study uses non-linear logistic regression techniques because the dependent variable is dichotomous, and the onset of violence is very uncommon: it occurs only 267 times out of approximately 5000 observations.

b. Independent Variable – ICT Adoption

The independent variable under scrutiny is the societal penetration of ICT in each country. Determining the composition of the ICT variable is imperative. Previous attempts to measure the power of information have included media such as television, radio, and newspaper (Warren, 2014), but a contemporary study must include new modes of information transference. Most analyses use only Internet penetration as the sole measure of ICT (Rød & Weidmann, 2015), but other forms exist. Thus, ICT as a term

should encompass the prominent technologies of modern communication. The percentage of both Internet users and mobile cellular subscriptions within a country are two direct indicators of the spread of ICT. The International Telecommunications Union and World Bank maintain reliable annual records for both measures on nearly every country from approximately 1985 onwards. For this study, measures of Internet availability and cellular penetration are combined to form the social media index (SMI) as a proxy for ICT:

$$SMI = Cell + Internet$$

The SMI attempts to encapsulate the extent to which ICT is available and accessible to civilians of any particular state. The number of mobile cellular phone subscriptions per 100 people (Cell) and the number of people per 100 with access to the Internet (Internet) combine equally to form the SMI term. The data underlying both Cell and Internet is imperfect as some individuals may have multiple cellular subscriptions and use both media to communicate both at home and at work. However, the SMI term is not bounded in order to permit a relative measure of ICT penetration among different countries during the same year or the same country over time. The value of this variable begins at 0 in most countries in 1990. The exclusion of so-called 'old media' in the SMI term is intended to focus analysis on the modern, social media technologies and their relationship to state stability.

c. Control Variables

To account for factors other than ICT that influence state stability (Hendrix, 2010), several variables commonly associated with socioeconomic development are added as controls. These controls include gross domestic product (GDP) per capita, total population, rural population, mountainous terrain, and ethnic fractionalization. GDP per capita often figures prominently in studies of state capacity, usually associating positively with levels of state stability. Fearon and Laitin (2013) assert that GDP per capita relates negatively to civil war onset, as it is a measure of a state's capacity to wield its monopoly of violence, while Collier and Hoeffler (2004) find a similar relationship, but interpret it to mean that GDP per capita reflects a state's capacity to compete for personnel

resources. Total population and rural population, expressed as a percentage of a state's total population, are included because ICT requires infrastructure, in the form of cable or phone lines and cellular towers, which can delay its spread to rural areas. Data regarding GDP, total population, and rural population is gathered from the World Bank's *World Development Indicators.*

The mountainous terrain and ethnic fractionalization controls originate from values developed by Sambanis' (2004) civil war database. Mountainous terrain, expressed as the percentage of a country's landmass covered by mountains, may have a similar delaying effect on media penetration as does rural population, and it may serve as a barrier to effective interstate commerce, communication, and power projection, also often giving rise to non-homogeneous areas within a country. The degree of ethnic fractionalization within a country, expressed as a percentage, may also be an obstacle to strong state control and is intended to account for the existence of identity cleavages within society (Warren, 2014).

d. Classification

For classification and analysis purposes, each state is assigned an annual 'polity2' score using data from the CSP's *Polity IV Project: Political Regime Characteristics and Transitions, 1800–2013*, a widely recognized political comparison system. The 'polity2' score is a revised combined polity score indicated as an integer value on a scale from -10 to 10 measured as the difference between each country's democratic and autocratic characteristics (CSP, 2015). Democratic countries receive higher positive scores.

2. Regression Model

The first step of the analysis employs a non-linear logistic regression to examine the relationship between state stability, the presence or absence of civil conflict onset, and the spread of ICT. The following is the general form of this study's non-linear logistic regression model:

$$P_{Stability} = \frac{e^{(c_0 + c_1 SMI + c_2 GDP + c_3 Pop + c_4 Rural + c_5 Mountains + c_6 EthFrac)}}{1 + e^{(c_0 + c_1 SMI + c_2 GDP + c_3 Pop + c_4 Rural + c_5 Mountains + c_6 EthFrac)}}$$

A logistic regression (or logit model) is chosen over linear regression techniques for several reasons. A logit model accounts for dependent variables that are categorical. In this case, as fitting with the conflict database, the dependent variable—stability—is dichotomous. The result is binary—a state is either stable or unstable. A linear model would not accurately predict the conditions of stability across states because such a regression would incorrectly predict states as partially stable, which is not a permissible condition of this analysis. In other words, a logistic regression provides a much better fit to the binary data points in the form of an S-curve; whereas a linear regression merely draws a single, straight line as an approximation between all the data points.

Each variable, including the controls, is collected in time series format to visualize trends. Variables within the models are both discrete and continuous, but SMI, in particular, begins at zero, increasing within states only as the Internet and cellular phones penetrate the society. As many countries were slow to adopt ICT, the SMI variable results in a very right-skewed distribution. Several of the controls also exhibit heavy-tailed distributions; thus, the models require applying a logarithmic transformation to the SMI, GDP, total population, and mountainous terrain variables. This transformation process attempts to account for the strongly skewed distributions of the data to approximate the normal distribution, which enables better predictions of the ICT and state stability relationship.

3. ICT and Authoritarian Regimes

The main models of this study compare the relationship concerning civil conflict onset and societal ICT penetration between democratic states and authoritarian regimes, and amongst different categories of authoritarian regimes. For general illustrative purposes, a binary value is assigned to countries with polity2 ratings. States with ratings greater than or equal to 5 on the CSP's *Polity IV Project* are deemed strong democracies,

while states with ratings of less than or equal to -5 are considered strong autocracies. Comparing countries situated at the extreme ends of the polity spectrum allows for broad trend analysis.

Furthermore, to reach the crux of the primary research question, authoritarian governments are categorized according to strict criteria to determine if different types of regimes perform equally when confronted with similar levels of ICT penetration. Rather than conduct detailed qualitative case studies on each of the approximately 100 authoritarian regimes worldwide, a broader quantitative analysis of these countries may identify trends regarding the spread of ICT in restricted environments. Authoritarian regimes are categorized using multiple models to include those proposed by Geddes, Hadenius, Diamond, and Cheibub (Cheibub, Gandhi, & Vreeland, 2010; Diamond, 2010; Geddes, 1999; Wahman, Teorell, & Hadenius, 2013). Datasets associated with these studies are available for replication and further research. This study primarily uses the four-category model proposed by Geddes (2014), as it serves as a simple, useful, and easily understandable model. These four authoritarian regime types are military, monarchy, one-party, and personal dictatorship. A state is coded as belonging to one of these four categories for each year if its government met Geddes' (2014) criteria.

To further test the hypothesis that certain types of authoritarian regimes adapt more readily to the challenges presented by SMI (*H5*), this study also creates a category of regimes with institutionalized succession mechanisms. This category includes the 39 one-party regimes and the eight monarchies from Geddes' (2014) study for separate testing. The term "institutional regime" is also a binary variable for use in the logistic regression models. By examining each of these variables in a systematic manner using the open source R software, this study arrives at some intriguing conclusions.

Although the onset of violence in authoritarian regimes remains the primary focus of this study, events that result in overall regime change, though much less frequent, can provide instructive lessons. Geddes (2014) provides a binary variable labeled regime failure (which is used in this study as a broad comparative measure) when one of several scenarios occurs. These scenarios include the successful conclusion of a competitive

election for the executive, a successful coup or uprising, a marked change in the rules of leader selection, or a transition to indirect military rule (Geddes, 2014).

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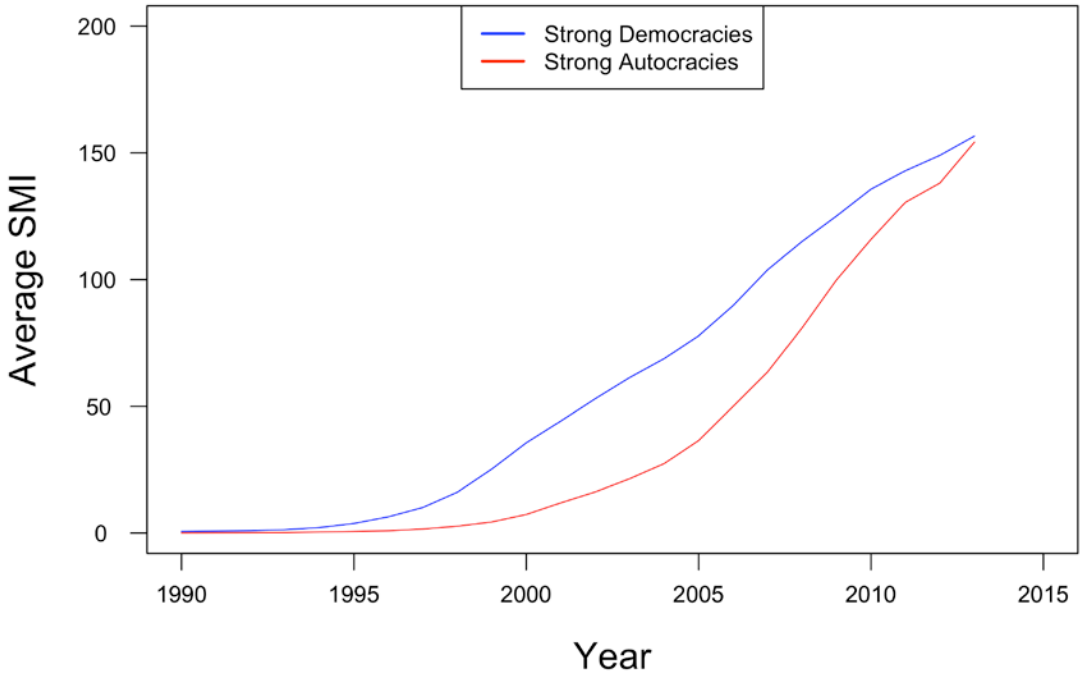
IV. ANALYSIS OF EMPIRICAL DATA

A. GENERAL RESULTS

Even before conducting any logistic regressions, a simple line graph of average SMI plotted by regime type provides evidence regarding *H1* and *H3*. Figure 1 does not support *H1* but rather supports its antithesis, *H3*, which states, *owing to ease of control over ICT infrastructure, authoritarian regimes will not inhibit the spread of ICT into their domains.*

Figure 1. SMI Adoption Rates



Data for Figure 1 obtained from the World Bank's *World Development Indicators* and the CSP's *Polity IV Project* dataset.

Figure 1 demonstrates that authoritarian regimes have not chosen simply to ban or limit access to ICT. While there is a perceptible gap between the early rate of SMI adoption between democracies (polity2 score > 5) and authoritarian regimes (polity2

score < -5) favoring democracies, by the end of the timeframe studied (2013) authoritarian regime ICT rates actually achieve parity with democracies. This initial adoption gap is possibly explained by technology origin or by GDP. The blue line depicting democracies includes numerous highly developed countries, such as Japan and the United States. However, the rapid adoption of ICT by authoritarian regimes coincides with the onset of cellular telephone proliferation in the early 21st century in the developing world, consisting of numerous autocratic governments, such as Azerbaijan, Sudan, and Vietnam.

B. RESULTS OF THE REGRESSION MODELS

The overall results of the analysis indicate that as SMI increased across all countries, and authoritarian regimes in particular, state stability, measured as the absence of civil conflict, increased. These results do not support *H2*, but they do support its contrary hypothesis, *H4*, which states, *increasing levels of ICT within authoritarian regimes will decrease levels of instability, at least in the short-term.* Table 1 depicts the results from the first four logistic models, which use all countries, regardless of their regime type classification, for their pool of data. Model 1 serves as the reference model without the SMI term, but with the five control variables (GDP, total population, rural population, mountainous terrain, and ethnic fractionalization). Strong democracies and strong autocracies are also included as terms within models for illustrative purposes. In Model 3, the democratic and autocratic categories are removed, replaced by a separate category for institutionalized authoritarian regimes. Finally, Model 4 differs from Model 3 with the inclusion of a term expressed as a multiplicative interaction between the SMI variable and institutional authoritarian regimes (monarchies and one-party states). Comparing the Akaike information criterion (AIC) scores from Model 1 with the results from the models that include the SMI term (models 2, 3, and 4) demonstrates that accounting for ICT penetration within society appears to improve the predictive accuracy of successive models regarding the onset of violence within countries.

Table 1. Global Regressions – Civil Conflict Onset

	Model 1	Model 2	Model 3	Model 4
SMI		-0.198***	-0.171***	-0.107
		(0.056)	(0.058)	(0.066)
GDP	-1.031***	-0.672***	-0.791***	-0.835***
	(0.229)	(0.242)	(0.258)	(0.257)
Population	0.880***	0.960***	0.927***	0.929***
	(0.113)	(0.119)	(0.127)	(0.128)
Mountains	0.178**	0.163**	0.207***	0.206***
	(0.071)	(0.072)	(0.076)	(0.076)
Rural	-0.008	-0.007	-0.006	-0.006
	(0.006)	(0.006)	(0.007)	(0.007)
Ethnic Frac	1.805***	1.689***	1.803***	1.776***
	(0.305)	(0.312)	(0.320)	(0.322)
Democracies		-0.550***		
		(0.174)		
Autocracies		-0.648***		
		(0.207)		
Institutionalized Authoritarian Regimes			-0.368**	-0.434**
			(0.179)	(0.190)
SMI*Institutionalized Authoritarian Regimes				-0.266**
				(0.130)
Constant	-6.295***	-7.579***	-7.442***	-7.300***
	(1.195)	(1.256)	(1.331)	(1.327)
Observations	3,481	3,413	3,048	3,048
Log Likelihood	-745.867	-713.460	-661.035	-658.851
Akaike Inf. Crit.	1,503.735	1,444.921	1,338.069	1,335.703
Note:				*p<0.1; **p<0.05; ***p<0.01

Data for Table 1 obtained from the World Bank's *World Development Indicators*, the CSP's *Polity IV Project* dataset, Sambanis' (2004) conflict dataset, and Geddes' (2014) regime categorization dataset.

Model 2 includes the independent variable, SMI, and each of the five controls. SMI, GDP, total population, and mountainous terrain are log transformed to account for their long-tailed distributions. This model shows a statistically significant ($p < 0.01$) negative relationship between SMI and the onset of civil conflict (instability). This does not support *H2*, but it does support *H4*, its antithesis. This model also includes the binary variables for strongly democratic and strongly authoritarian regimes. Both of these variables have a statistically significant negative relationship with the onset of violence ($p < 0.01$). This result indicates that regardless of regime type, SMI appears to have a stabilizing effect on states.

Model 3 includes the independent variable, SMI, each of the five controls, and a variable representing what this study terms institutionalized authoritarian regimes. This term combines Geddes' (Geddes, Wright, & Franz, 2014) categories of monarchies and one-party states. Both of these categories behave similarly when modeled, and most examples of either regime type provide an institutionalized mechanism for power transfer: heredity succession in monarchies and intra-party succession in one-party states. When modeled together under the binary institutional variable, they have a significant ($p < 0.05$) negative relationship with the onset of violence.

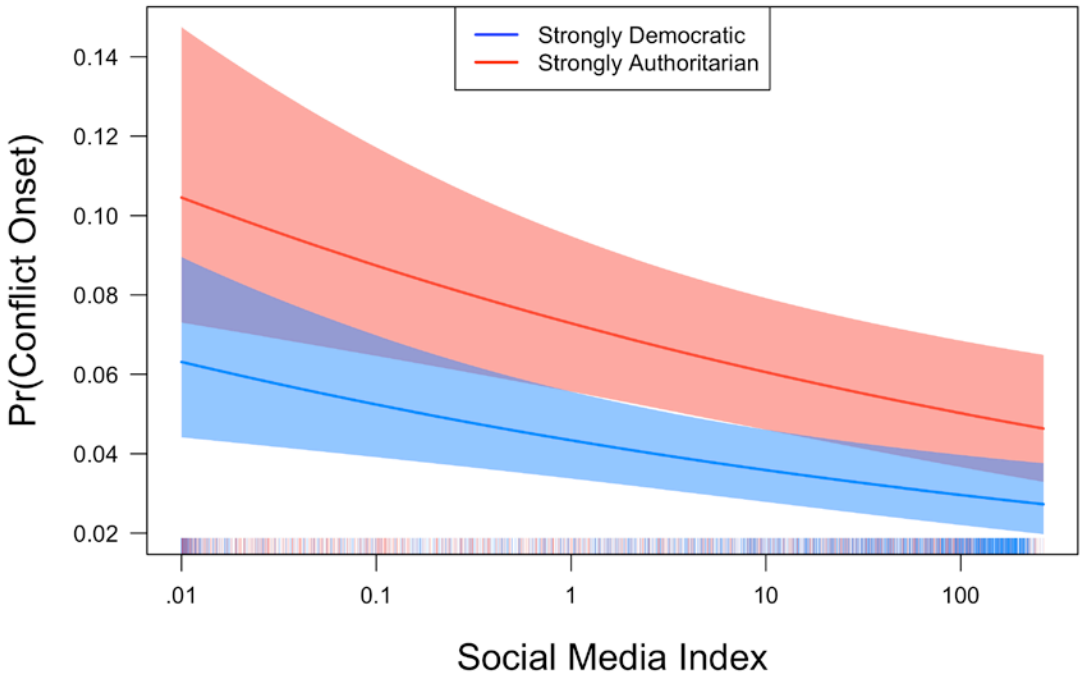
Model 4 differs from Model 3 with the inclusion of a term expressed as a multiplicative interaction between the SMI variable and institutional authoritarian regimes (monarchies and one-party states). Institutional regimes and the SMI*Institutionalized Authoritarian Regimes interaction terms are both strongly significant ($p < 0.05$). The results of Model 4 demonstrate a strong statistically significant negative relationship between SMI and the onset of violence in institutional authoritarian regimes: as ICT rates rise in these particular states, violence appears to decrease. In contrast, the model shows that non-institutionalized authoritarian regimes seem to experience no such statistically significant pacifying effects from ICT penetration. As confirmed by several robustness checks, Model 4 is the most predictive model of the four, as it provides the best fit for the dataset employed in this part of the study.

It is possible to visualize the rather strong, statistically significant, negative relationship between SMI and civil conflict onset (instability) from Model 2 in a rather

striking manner. By examining nearly all UN recognized, sovereign states from 1990 to 2013, a general trend emerges. As SMI increases across countries, the onset of civil conflict decreases. This trend is reflected when strong democracies (polity2 score > 5) are compared with strong autocracies (polity2 score < -5), as shown in Figure 2. This figure illustrates the expected probability of civil conflict onset in strong democracies and strong autocracies for each year between 1990 and 2013, for all levels of SMI, when the control variables are held constant at their means. The shaded, semi-transparent color regions represent 95% confidence intervals for each estimated effect. There is little overlap of these standard area regions between strong democracies and strong autocracies except where SMI rates are at the extremes.

Although the relationship between SMI and civil conflict onset is statistically significant, the difference in the rate of change between strong democracies and strong autocracies was not statistically significant. Several iterations of Model 2 (not shown in Table 1) were run to test the effect on civil conflict onset as SMI increased across country types. These tests included the use of multiplicative interactive terms with strong democracies and strong autocracies and even the inclusion of anocracies (countries with polity2 scores between -5 and 5) into the model, but to no avail. The non-statistically significant results suggest that categorizing states simply according to their polity2 score may not serve as the best method to predict civil conflict onset among groups of countries.

Figure 2. Strong Democracies vs. Strong Autocracies



Data for Figure 2 obtained from the World Bank's *World Development Indicators*, the CSP's *Polity IV Project* dataset, Sambanis' (2004) conflict dataset, and Geddes' (2014) regime categorization dataset.

Although Figure 2 presents an interesting visual phenomenon, it is necessary to compare institutionalized authoritarian regimes (monarchies and one-party) with non-institutionalized authoritarian regimes (military and personal) to test and examine how these different forms of autocracies respond to increasing rates of ICT penetration. As depicted in Table 2, models 5, 6, and 7 use a reduced pool of data, only regimes identified as authoritarian, as compared to models 1, 2, 3, and 4. Model 5 serves as the base model, with only the five controls. Model 6 includes the five controls, the independent variable, SMI, and the institutionalized authoritarian regime term, consisting of monarchies and one-party states. Model 7 differs from Model 6 with the inclusion of the term expressed as a multiplicative interaction between the SMI variable and institutional authoritarian regimes.

Table 2. Authoritarian Regressions – Civil Conflict Onset

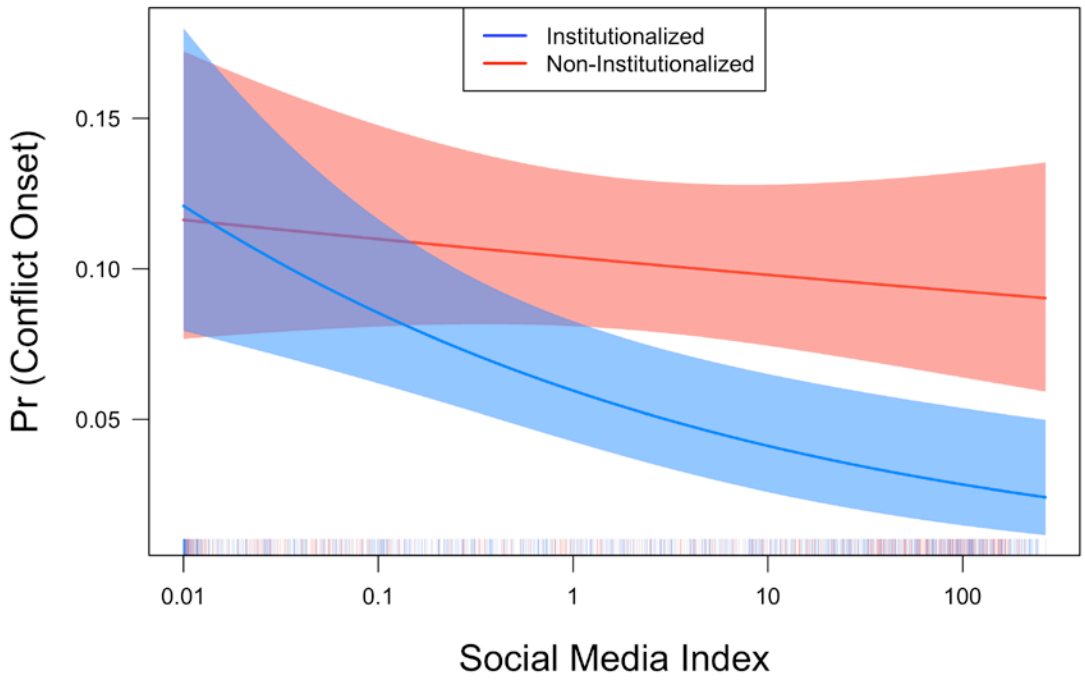
	Model 5	Model 6	Model 7
SMI		-0.178**	-0.064
		(0.070)	(0.085)
GDP	-0.853**	-0.413	-0.405
	(0.380)	(0.412)	(0.409)
Population	0.643***	0.757***	0.745***
	(0.174)	(0.180)	(0.181)
Mountains	0.209**	0.241**	0.237**
	(0.095)	(0.098)	(0.098)
Rural	-0.006	-0.0001	0.0003
	(0.009)	(0.010)	(0.010)
Ethnic Frac	1.810***	1.659***	1.626***
	(0.403)	(0.409)	(0.413)
Institutionalized Authoritarian Regimes		-0.529**	-0.604***
		(0.208)	(0.217)
SMI*Institutionalized Authoritarian Regimes			-0.324**
			(0.139)
Constant	5.229***	-7.434***	-7.374***
	(1.966)	(2.096)	(2.083)
Observations	1,494	1,478	1,478
Log Likelihood	-417.437	-398.103	-395.268
Akaike Inf. Crit.	846.874	812.205	808.536
Note:			*p<0.1; **p<0.05; ***p<0.01

Data for Table 2 obtained from the World Bank's *World Development Indicators*, the CSP's *Polity IV Project* dataset, Sambanis' (2004) conflict dataset, and Geddes' (2014) regime categorization dataset

As illustrated in Figure 3, Model 7 demonstrates that regimes with institutionalized forms of succession, regardless of the degree of their authoritarianism

(polity2 score), experience decreasing conflict onset as ICT penetration increases. The decrease in internal violence is dramatic, dropping almost threefold from ICT inception to the high levels of ICT adoption in 2013. The relationship between SMI and conflict onset in authoritarian regimes without institutionalized forms of succession is noticeable but comparatively slight (an approximate 20% decrease), though the standard error (shaded, semi-transparent region) is high. This may indicate that the adoption of ICT in such regimes has little effect on conflict onset. Thus, these results support *H5: Given their existing institutionalized succession mechanisms and their propensity to co-opt opposition forces, one-party regimes and monarchies will experience less internal violence, as compared to military and personal dictatorships, in the face of rising ICT rates.*

Figure 3. Conflict Onset within Institutionalized and Non-Institutionalized Regimes



Data for Figure 3 obtained from the World Bank's *World Development Indicators*, the CSP's *Polity IV Project* dataset, Sambanis' (2004) conflict dataset, and Geddes' (2014) regime categorization dataset

The remaining control variables generally behave as expected, and their inclusion or exclusion does not alter the central results. As total population, percentage of land area covered by mountains, and ethnic fractionalization increases, state stability systematically decreases, to a statistically significant degree. These findings support previous work that quantitatively established the importance of such factors (Fearon, 2013). In contrast, the removal or addition of the rural population variable appears to have little predictive effect on the onset of violence across all models, though the rural population variable was marginally negatively associated with the onset of civil conflict across models 1 through 5. This finding may suggest that rural locations pose less of a barrier to ICT penetration as compared to communication media of the past (Warren, 2014). Taken as a whole, the results suggest that SMI, the proxy for ICT penetration, can serve as a valid predictor of the onset of civil conflict within states. As depicted in Table 1, the results indicate that as SMI increases, state stability is also expected to increase.

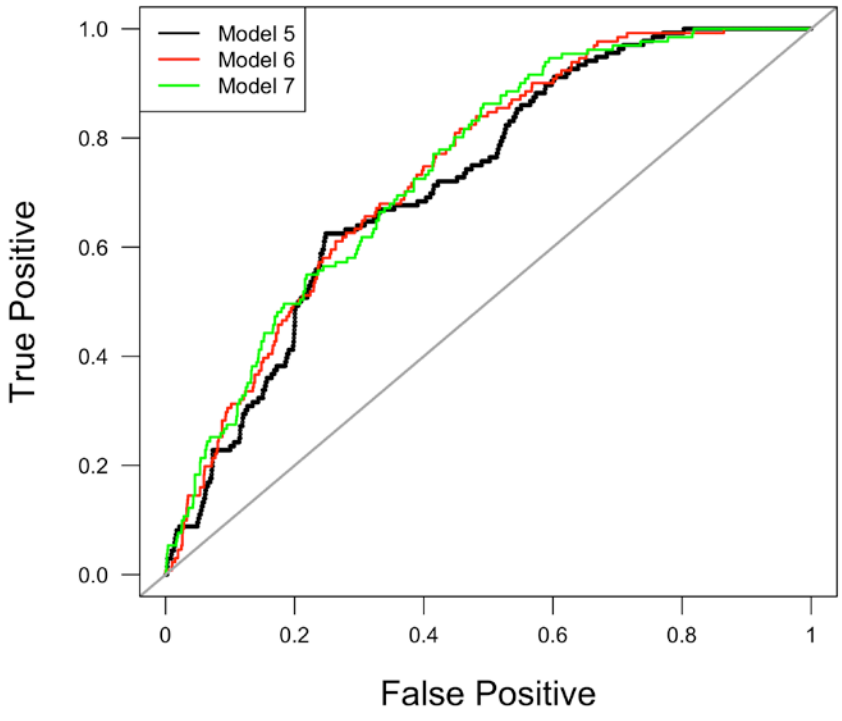
C. ROBUSTNESS CHECKS

One way to measure the predictive capacity of a model is to use the Akaike information criterion (AIC). This measurement is displayed at the bottom row of Table 1 and Table 2. AIC generates a score for a model's predictive ability, or its ability to 'fit' a dataset, while penalizing it for its complexity (Akaike, 1974). Comparing the results from Model 1 with the results from the models that include the SMI term (models 2 through 4) demonstrates that accounting for ICT penetration within society enhances the ability to predict the onset of conflict within countries. A lower score represents better predictive ability, which, in this case, indicates that Model 4 (AIC = 1335) does a better job of predicting the onset of violence than models 1, 2, and 3, despite its increased complexity. Similarly, for the dataset analysis that included only authoritarian regimes, Model 7 (AIC = 808) does a better job of predicting the onset of violence than Model 5 (AIC = 846), which does not include the SMI variable.

A second way to test whether SMI is a useful predictor of the dichotomous outcome of the onset of civil conflict within states or simply a proxy for other state capabilities, is the production of receiver operating characteristic (ROC) curves for

models 5 through 7. ROC curves provide a graphical illustration of the performance of binary classification systems. They are a measure of the sensitivity (true-positive) as a function of the fall-out (false-positive) of a model. ROC curves provide a visual aid in determining which models perform better than others in predictive scenarios. The ROC curves for models 5 through 7 are shown in Figure 4. A common method to more accurately analyze the predictive power of models visualized using ROC curves is to measure the area under the curve (AUC). The greater the AUC, the more accurate the model. Although the models are highly accurate relative to one another, among the models that include the SMI term in the authoritarian regime dataset, Model 7 appears the most predictive with the greatest AUC value (0.743). Compared to Model 6 (AUC = 0.740), Model 7 demonstrates a slight increase in predictive accuracy. All of the models that contain the SMI term demonstrate higher levels of predictive capacity as compared to Model 5 (AUC = 0.720), which does not contain the SMI term.

Figure 4. ROC Curves



Data for Figure 4 obtained from the World Bank's *World Development Indicators*, the CSP's *Polity IV Project* dataset, Sambanis' (2004) conflict dataset, and Geddes' (2014) regime categorization dataset.

D. SUMMARY OF RESULTS

The various analyses conducted directly address the five hypotheses offered at the beginning of this study. The evidence indicates that authoritarian regimes have not suppressed the proliferation of ICT, but rather the Internet and cellular telephones have penetrated these closed societies to nearly the same extent as the world's open democracies. Whether autocracies have embraced ICT or they have been unable to stem their advance, the presence of social media-enabling technology has not led to increased violence. In fact, as SMI rates rose, the onset of conflict decreased in strong autocracies to a much greater extent than in strong democracies. As hypothesized, autocracies with institutionalized succession mechanisms, regardless of their degree of authoritarianism, experienced a statistically significant decrease in the onset of conflict as SMI rates increased whereas non-institutionalized authoritarian regimes did not experience a corresponding decrease in violence. The development of increasingly complex models confirmed the usefulness of pre-existing factors that predict conflict onset within countries. The addition of the SMI term and the incorporation of the interaction between SMI and countries categorized as institutionalized regimes provides for an even more predictive modeling tool.

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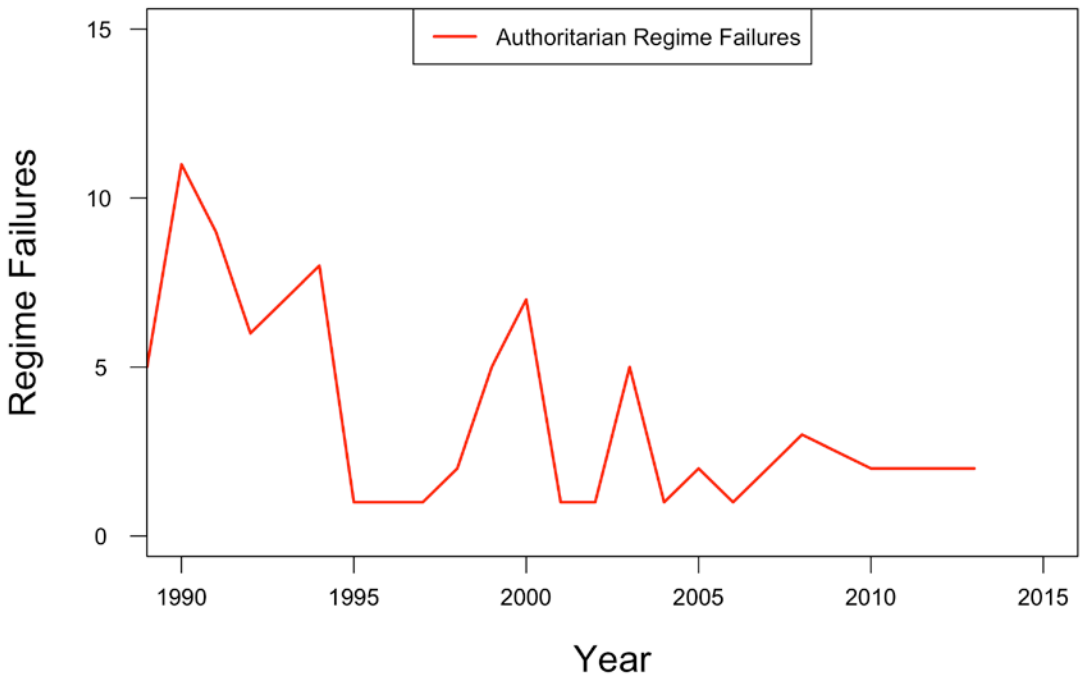
V. IMPLICATIONS AND PROJECTIONS

This logistic regression analysis of the available empirical data provides evidence with a high degree of probability that a negative relationship exists between increasing levels of SMI diffusion and the onset of civil conflict (instability) within states. In other words, as ICT further penetrates states, those states appear to become more stable. This association is especially clear among states labeled as strong autocracies, and specifically amongst regimes with institutionalized succession mechanisms, regardless of the government's degree of political openness. The relationship of Internet and cellular phone diffusion to the commencement of extreme mass violence, as observed during the period 1990 to 2013, appears to favor these authoritarian regimes. Among the various variables that serve as useful predictors of the onset of violence within states, SMI, a proxy for ICT, can be added as a statistically significant measure.

Whereas the spread of modern communication and organizational mediums within democracies does not appear to substantially alter the probabilities of internal strife, these tools seem to empower dictators rather than their subjects. This finding is an essential avenue for further quantitative and qualitative research. Although the events of the Arab Spring might suggest that the use of ICT favors disaffected populations over their repressive governments, that sentiment is not borne out in this analysis. Further, the Arab Spring may have been a temporary, localized aberration. As much as ICT can be used for communication and organization, it can just as easily be used to censor and suppress. The measure used in the analysis to differentiate between democracies and autocracies and to rate their relative strengths (polity2) is itself an amalgam of several other state factors. Thus, to determine which regimes successfully suppress violence despite the spread of ICT, beyond the simple categorization of regimes with institutionalized succession mechanisms, it may prove useful to examine more specific characteristics such as the degree of freedom given to the press, the total amount of resources allocated to internal surveillance programs, and the percentage of GDP assigned to internal security forces.

As Figure 5 demonstrates, the Arab Spring did not herald the end of authoritarian regimes across the globe. Instead, the few governments that toppled in the Middle East were merely a part of the global trend that saw total authoritarian regime failures decrease from 1990 to the present. This period coincided with the global rise of ICT as depicted in Figure 1. This study does not assert that a direct correlation exists between ICT diffusion and the onset of violence within authoritarian regimes, but a relationship between the two seems plausible. It is worth examining in greater detail the composition and features of authoritarian regimes that allow them to leverage ICT characteristics to delay or prevent the onset of conflict.

Figure 5. Authoritarian Regime Failures



Data for Figure 5 obtained from Geddes' (2014) regime categorization dataset.

Further still, future research could explore expanding the composition of the ICT proxy used in this analysis to create a more complex SMI term using specific forms of social media, such as Facebook, Twitter, Sina Weibo, FireChat, etc. All models of this analysis indicated that preexisting elements of ethnic fractionalization are strongly related

to the emergence of internal state conflict. Forms of identity cleavages and existing grievances may serve as better predictors of violence than the spread of ICT or the type of social media available to a disenfranchised group.

Nevertheless, this study examines the relationship between the rise and spread of ICT and the onset of civil conflict during an era that begins with the introduction of the Internet and ends with cellular telephones becoming as ubiquitous in the third world as they are in the first world. The results indicate that as ICT adoption increases from zero per capita, authoritarian regimes become more adept at suppressing internal violence. What useful insight does this finding and the reasons for this phenomenon provide to governments, and the groups that wish to overthrow them, as ICT penetration rates continue to rise? Do the lessons from the results of this analysis remain pertinent to the few states where ICT have not universally penetrated society, are they transferable to states that experience the next communications revolution, or do they contain valuable insight into current information battles between states and non-state actors? One thing the results of this research have made abundantly clear is that the events of the Arab Spring did not portend an era of new forms of ICT giving absolute power to the people, but rather ICT enabled existing authoritarian regimes to solidify their hold on power to such a great extent that they were able to significantly reduce the incidents of major violence within their territories. While ICT unquestionably lowers the costs of coordination for repressed populations, the key to regime change still relies heavily on the physical ability to organize. As Hoffman stated when discussing the situation in Cuba, “The crucial fault-line remains the physical space on the island, where the costs for individual voice and collective action remain high” (Cavatorta, 2012).

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